



**FACULTY OF ELECTRICAL ENGINEERING
AND INFORMATION SCIENCE**



**INFORMATION TECHNOLOGY AND
ELECTRICAL ENGINEERING -
DEVICES AND SYSTEMS,
MATERIALS AND TECHNOLOGIES
FOR THE FUTURE**

Startseite / Index:

<http://www.db-thueringen.de/servlets/DocumentServlet?id=12391>

Impressum

Herausgeber: Der Rektor der Technischen Universität Ilmenau
Univ.-Prof. Dr. rer. nat. habil. Peter Scharff

Redaktion: Referat Marketing und Studentische
Angelegenheiten
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Redaktionsschluss: 07. Juli 2006

Technische Realisierung (CD-Rom-Ausgabe):
Institut für Medientechnik an der TU Ilmenau
Dipl.-Ing. Christian Weigel
Dipl.-Ing. Marco Albrecht
Dipl.-Ing. Helge Drumm

Technische Realisierung (Online-Ausgabe):
Universitätsbibliothek Ilmenau
[ilmedia](#)
Postfach 10 05 65
98684 Ilmenau

Verlag:  Verlag ISLE, Betriebsstätte des ISLE e.V.
Werner-von-Siemens-Str. 16
98693 Ilmenau

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ISBN (Druckausgabe): 3-938843-15-2
ISBN (CD-Rom-Ausgabe): 3-938843-16-0

Startseite / Index:
<http://www.db-thueringen.de/servlets/DocumentServlet?id=12391>

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New Conception on the Electrical Machine Brush Gear with auxiliary Brushes

ABSTRACT

The contribution is dedicated to the sliding contact problems and its verification in operational conditions on DC and synchronous machines. The experimental check of the new brush gear conception with auxiliary brushes on base teflon are presented.

KEYWORDS

Electrical machine, sliding contact, machines testing, innovation, new technologies.

PRELIMINARY

The sliding contact specifications and its practical testing has been presented on conferences in TH Ilmenau during many years. Step by step has been presented either innovated construction designs of sliding contact or testing machines assortment. Ambient surrounding parameters and operative conditions have been changed. We can generally say that we are gradually coming to higher machines performances, where the sliding contact requirements increase. In contribution are presented some achievement results at amelioration service property hydroelectric generator and turbo-generator in Czech republic.

Indisputable positive contribution has at amelioration service property electrical machine with shear contact application of the teflon on brush and holder brush.

At application on one machine, especially there, where reacts combination stress vibration and temperatures, however can reach the erosion textures innovate brushes. Positive effect with thereby belittles.

For elimination hereof negative incidence mechanical and heat stress on innovate brushes was development new brush gear conception below titled "intelligent brush gear", if need be in simplest variant like "brush gear with auxiliary brushes" on base teflon.

APPLICATION OF “NEW CONCEPTION OF SLIDING CONTACT” OF ELECTRICAL MACHINES

Enhancing of operating properties of electrical machines with commutator and rings is consistently in prominence of interest about this category of electrical machines on UVEE FEKT VUT in Brno.

Existing externalization of works was oriented to teflon-using for miscellaneous parts of collector mechanism (brush, brush holder). Modification of this part can be considered as very successful. Using of teflon as a material for this components of collector mechanism implies handling of modern technologies and respect increase of manpower in laboratory production of this components. Elimination of these disadvantages allows new conception of collector mechanism by Fig. 1. In conclusion principle and results of laboratory tests on special electrical machine are described.

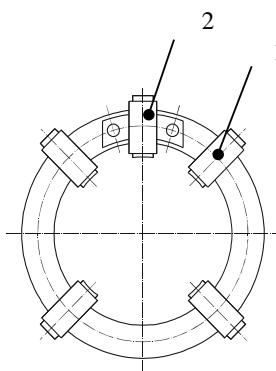


Fig. 1: Representation of the construction version of new collector mechanism conception after completion of tests on electrical machine.

*1 – primary brush holder,
2 – innovated brush holder.*

2.1 Application in the engine starter

The design of starters follows the trend of the seventies and eighties [4]. The strong pressure from the side of manufacturers to reduce dimensions and weight, and increase the service life on the one hand, and the availability of ferromagnetic materials on the other hand, lead, at that time, all manufacturers to introduce starters with gear (spur or epicyclical gear). This concept, which has been used until these days (e.g. by the companies Bosch, Denso, MAGNETON and others – see Fig.2, 3), enabled to reduce the weight by as much as 30 % while keeping the output parameters.

a)



b)

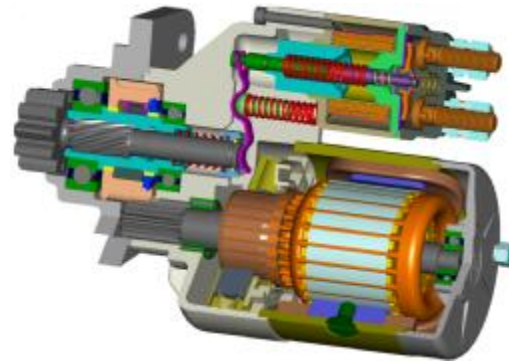


Fig. 2. a) Geared engine starter MAGNETON, 12 V/1 kW (spur gear)
b) Cross section of the geared engine starter MAGNETON

In spite of the indisputable advantages of starters with gear, mainly their higher noise, lower reliability (inserted gears) and high production intensity are the reason why car manufacturers are interested in returning to the concept of starters without gear. The output parameters, dimensions, weight and higher service life must be, however, kept.

Research and development in the application of exciting a starter by permanent magnets based on rare earth's with the use of the positive characteristics of this arrangement in order to improve the retraction of the pinion are the promise of not only the reduction of the dimensions and weight of the device itself, but also the considerable increase of the service life.

Having finished service life competitive examinations starter with scaler 12V, 1kW, near whose was aplikovan innovating frictional knot according to proposal, see giant.1, was test data prezentovany in test report [2]. Average attrition brush up 5000 start amounts 0,35mm (2,8%) near polarity brush + and 0,10mm (0,8%) near negative polarity brush. Is then evident, that brushes positive polarity with comminution 3,5 x more. Average wear of the brushes are 0,113mm. The commutator wear hasn't been located.

For impartial appreciation attained record was these funds comparison with record long-term competitive examinations starter with scaler 12V, 1kW with original fulfilment frictional knots. Hereof starter be in record enunciation, that up fulfilment 45 000 start do general attrition brush 1,3mm and attrition cutout do 0,17mm. Providing linear growth sizes attrition brush near innovate frictional knots it is possible come to a conclusion, that size attrition brush innovate frictional knots with auxiliary brushes be about 22% against to attrition of the original brush frictional knots.

Innovative frictional knot it is possible from standpoints sizes attrition account successful therewith, that near concrete machinery requires optimalization especially sizes thrust force. The damage of the commutator machine is eliminated.



Fig.3: Illustration state brush gear with auxiliary brushes having finished long-term competitive examinations

2.2 Application on synchronous machine

New constructional fulfilment brush gear was verified on TG 200MW of purpose lower size attrition brush operate machinery. Attained record they are state in fig.4.

a)



b)



Fig. 4: a) View of make-up operate TG.

b) Illustration constructional make-up aggregate.

Legend: T - turbine, G - generator, K1,K2 – slip-ring, Budič - excitor

	Original frictional node [hour]	Innovative frictional node D in executed. "with T" auxiliary brush [hour]
Run time machinery for achievement wear of 10 mm	1027,8	1675
Theoretic run time machinery	4528	4863

Tab. 1. Comparison of the machinery run length for original constructional fulfilment brush gear and brush gear with auxiliary brushes.

CONCLUSION

The results of the long-time testing of the electric machines with sliding contact are documented in this contribution. As well is presented practical utilizing new constructional fulfilment brush gear. We can conclude that innovation possibilities of classic-designed frictional node are not still perfectly improved and this new realisation can bring us very useful effects.

ACKNOWLEDGEMENTS

This contribution was supported in part by the Czech Grant Agency under Grant MSM 0021630516.

References:

- [1] VESELKA, F.: Analýza dějů probíhajících v motoru při zkoušce zapínání a vypínání. TZ 0306, Brno listopad 2003
- [2] ŠTOREK, P., VESELKA, F.: Měření ovality a vystupování lamel komutátoru na rotoru automobilového spouštěče. TZ 0301 Brno prosinec 2002
- [3] VESELKA, F.: Diagnostika a expertní posouzení sběracího ústrojí TG 200MW. Závěrečná zpráva, Brno 2004
- [4] HÁJEK, V., KUCHYŇKOVÁ, H.: Automobile Electric Machines - Future Trends. ISEM 2004, Praha 2004

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